1 / INTRODUCTION TO BASIC CONCEPTS IN EXPERIMENTAL DESIGN

1.1 INTRODUCTION

The term *experimental design* refers to five interrelated activities required in the investigation of scientific or research hypotheses. These activities, listed in the order performed, are as follows:

1. Formulate statistical hypotheses and make plans for the collection and analysis of data to test the hypotheses. A statistical hypothesis is a statement about one or more parameters of a population. Statistical hypotheses are rarely identical to research or scientific hypotheses but are testable formulations of research hypotheses.
2. State decision rules to be followed in testing the statistical hypotheses.
3. Collect data according to plan.
4. Analyze data according to plan.
5. Make decisions concerning the statistical hypotheses based on decision rules and inductive inferences concerning the probable truth or falsity of the research hypotheses.

The term *experimental design* is also used in a more restricted sense to designate a particular type of plan for assigning subjects to experimental conditions and the statistical analysis associated with the plan. The meaning of the term is generally clear from the context in which it is used.

SUBJECT MATTER AND GENERAL ORGANIZATION OF THIS BOOK

The concepts and procedures involved in carrying out steps 1, 2, 4, and 5 above comprise the subject matter of this book. Experimental design is only one of the many facets of scientific research. A carefully conceived and executed design is of no avail if the scientific hypothesis that originally led to the experiment is without merit.

A detailed examination of the logical and statistical aspects of specific experimental designs begins in Chapter 4. The first three chapters provide an overview of experimental designs. a review of basic statistical